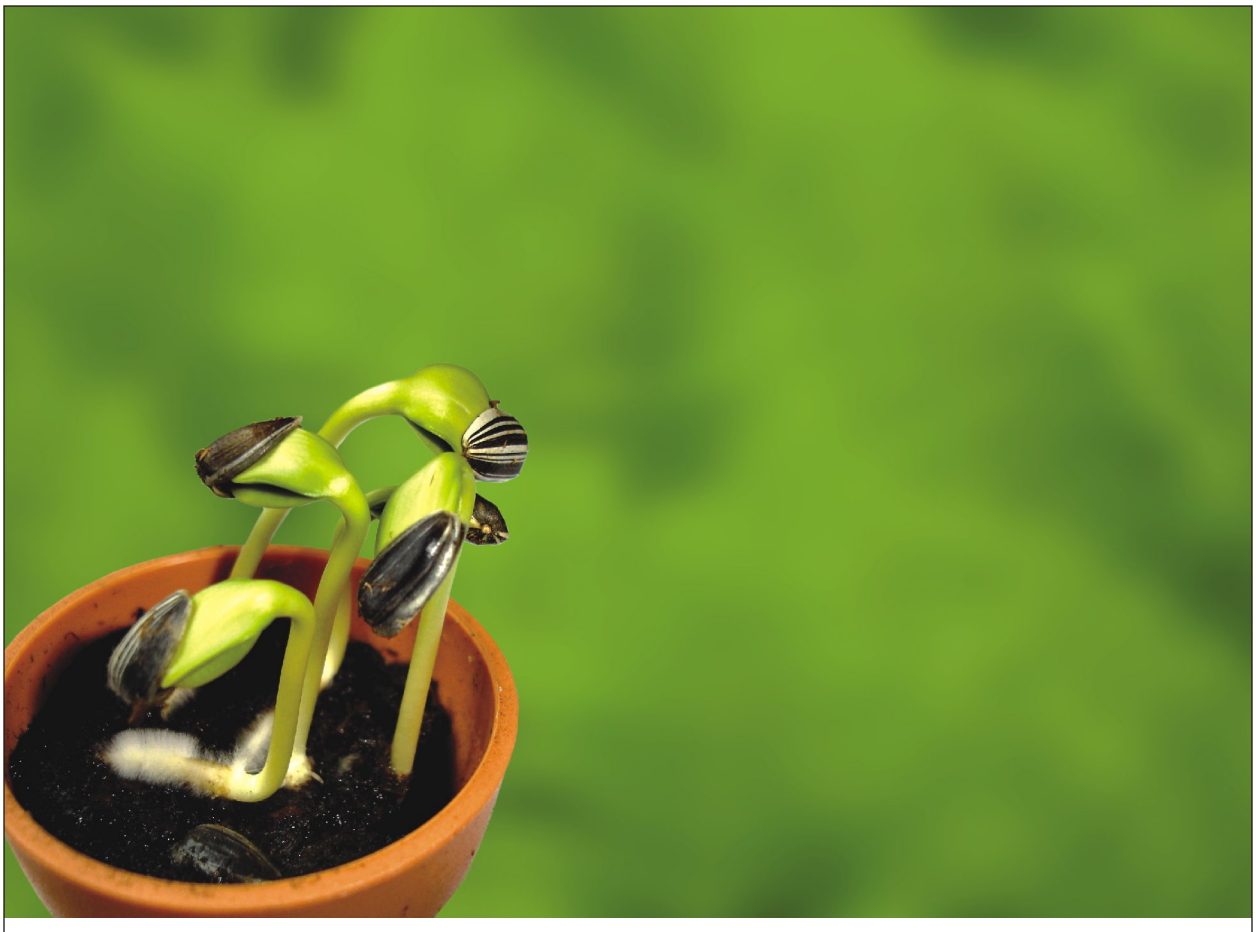

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Adaptability of Field Pea (*Pisum sativum* L.) Varieties Under Irrigation, Western Amhara Region, Ethiopia

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ABSTRACT

This study was conducted with the objective of identifying adaptable and relatively high yielding field pea varieties for irrigation production at koga and Rib irrigation areas and similar agro-ecologies. Seven released field pea varieties (Burkitu, Adet-1, Sefinesh, Gume, Tegegnech,Wolmera, Hassabe) and local check were evaluated at Koga and Rib from 2011/12 to 2012/2013 under irrigation condition using Randomized complete block design (RBD) with three replications. A seed rate of 75 kg ha^{-1} and fertilizer rate of 100 kg ha^{-1} DAP were used during the execution of the experiment. Combined analysis of variance for seed yield showed no significant difference among Environments (E), Genotypes (G) and Genotype by Environment interaction (GE). Powdery mildew infestation was higher due to the high temperature situation of the testing locations but observed after pod setting and no chemical and other control options were applied to control powdery mildew disease. Variety Tegegnech was high yielding (2427.5 kg ha^{-1}) followed by Burkitu (2202.8 kg ha^{-1}). In conclusion, controlling powdery mildew with chemical or other Integrated disease management options, variety Tegegnech and Burkitu are recommended to use for production under irrigation for grain yield at Koga and Rib and similar agro-ecologies.

Key words: Irrigation, field pea, GE interaction

INTRODUCTION

Grain legumes occupy a unique position in world agriculture by virtue of their high protein content and capacity to fix atmospheric nitrogen. Field pea (*Pisum sativum* L.) is grown in many countries and currently ranks fourth among the pulses in the world with cultivated area of 6.33 M ha (FAO., 2012). In Ethiopia, the crop is widely grown in mid to high altitude and ranks fourth in area coverage reaching 212,890 ha with an annual production of 2,632,663.87 t (FAO., 2012). It is the major food legumes with a valuable and cheap source of protein having essential amino acids (23-25%) that have high nutritional values for resource poor households (Nawab *et al*., 2008). The crop has important ecological and economical advantages in the highlands of Ethiopia, as it plays a significant role in soil fertility restoration and also serves as a break crop suitable for rotation to minimize the negative impact of cereal based mono-cropping (Angaw and Asnakew, 1994). It is also used as a source of income for the farmers and foreign currency for the country (Girma, 2003). Having all these multiple benefits in the economic lives of the farming communities, however, the average yield of the crop is only 1.24 t ha^{-1} in Ethiopia (FAO., 2012) which is far below the potential 40-50 t ha^{-1} traditionally achieved in Europe

(Netherlands, France and Belgium) and the worldwide average yield of 1.7 t ha^{-1} (Smykal *et al.*, 2012). Lack of improved high yielder varieties resistance to diseases, insects and abiotic calamities for specific location with appropriate agronomic recommendations can be cited as a major reason for this low productivity. According to Telaye *et al.* (1994), the yield of field pea may be reduced by several factors among which disease, insect pests, frost, poor cultivars and poor management practices are outstandingly important. The presence of diverse agro-ecological conditions and construction of irrigation schemes in Amhara region is an opportunity to improve the existing field pea productivity. But currently status of field pea production is becoming low and low through time in the region. To satisfy the specific demand of the market and to address the requirements of end-users, there is a need to produce field pea crop under irrigation in addition to the main season through adaptation of improved field pea technologies. Therefore, this study was conducted with the objective of identifying adaptable and relatively high yielding varieties for irrigation production at koga and Rib irrigation areas and similar agro-ecologies.

MATERIALS AND METHODS

Seven released field pea varieties (Burkitu, Adet-1, Sefinesh, Gume, Tegegnech, Wolmera, Hassabe) and local check were evaluated at Koga and Rib from 2011/12 to 2012/2013 under irrigation condition (Table 1). Randomized complete block design (RBD) with three replications was used throughout the testing locations. A seed rate of 75 kg ha^{-1} and fertilizer rate of 100 kg ha^{-1} DAP were used during the execution of the experiment. The irrigation frequency used was one day a week.

RESULTS AND DISCUSSION

Combined analysis of variance for seed yield (Table 2) showed no significant difference among Environments (E), Genotypes (G) and Genotype by Environment interaction (G×E). No significant variations observed for all of the parameters tested except 100 seed weight among genotypes across all locations, indicating the existence of no variability among the tested genotypes under irrigation

Table 1: Brief description of experimental sites

				Temperature (°C)		Global positions	
Location	Altitude (m)	Soil type	pH	Min	Max	Latitude	Longitude
Koga	1900	Nitisol	5.38	16	20	11°10' N to 11°25' N	37°02' E to 37°17' E
Rib	1800	fluvisol	5.96-6.02	18	21	37°29' to 37°59'	11°41' to 12°02'

Table 2: ANOVA Table for seed yield of 8 field pea varieties combined over location and year

Source of variation (SOV)	df	Mean square
Genotype (G)	7	487138ns
Location (E)	1	170540ns
Year	1	28461165ns
Genotype× Environment (G×E)	7	206895ns
Genotype×Year (G×Y)	7	144788ns
Pooled error	62	234321.77

ns: Non significant, df: Degree of freedom

Table 3: Mean grain yield and other agronomic characters of 7 field pea varieties combined over location and year

No.	Treatments	SP (%)	DF	DM	PM	PH	NPPP	NSPP	100 SW	GY Burkitu
1	126.08	65.33	113.67	7.00	96.03	11.48	5.06	19.15	2202.80	
2	Adet-1	130.08	65.50	112.75	7	112.50	12.02	5.28	16.52	1857.60
3	Sefinesh	124.92	65.83	113.83	7	106.93	12.27	5.35	17.30	2033.10
4	Gume	124.33	64.17	111.67	7	114.15	13.90	5.10	20.66	2032.10
5	Tegegnech	123.17	64.75	112.67	7	106.17	15.20	5.14	19.28	2427.50
6	Wolmera	129.00	65.58	113.83	7	96.65	12.17	5.46	118.78	2063.90
7	Hassabe	127.42	65.17	111.75	7	116.10	12.29	5.46	16.89	1175.20
8	Local check	125.08	64.58	112.50	7	99.65	13.80	5.16	16.13	2133.30
	Mean	126.26	65.11	112.83	7	105.97	12.89	5.25	18.09	2065.68
	LSD (5%)	-	-	-	-	-	-	-	2.97	601.18
	CV (%)	29.75	8.11	1.29	-	23.35	29.33	14.81	20.20	23.00
		ns	ns	ns		ns	ns	ns	*	ns

*Significant at 0.05, ns: Non significant, df: Degree of freedom, SP: Stand percent, DF: Days to flower, DM: Days to maturity, PM: powdery mildew (1-9 scale), PH: Plant height, NPPP: No. of pod per plant, NSPP: No. of seed per plan, 100 SW: Hundred seed weight and GY: Grain yield

condition (Table 3). Powdery mildew infestation was higher due to the high temperature situation of the testing locations but observed after pod setting (Table 3). No chemical and other control options were applied to control powdery mildew disease. According to Lesznyak *et al.* (2007) and Payne *et al.* (2000) point out that the sum of maximum daily temperatures above 25.6°C during the reproductive phases of crop had negative effect on yield. However; the variety Tegegnech was high yielding (2427.5 kg ha^{-1}) followed by Burkitu (2202.8 kg ha^{-1}) (Table 3).

CONCLUSION

Combined ANOVA indicated no significant variations among environments, among varieties and interactions across all locations. Powdery mildew and high temperature was serious problem for field pea under this irrigation trial. Variety Tegegnech was high yielding (2427.5 kg ha^{-1}) followed by Burkitu (2202.8 kg ha^{-1}). In conclusion, controlling powdery mildew with chemical or other Integrated disease management options, variety Tegegnech and Burkitu is recommended to use for production under irrigation for grain yield at Koga and Rib and similar agro-ecologies.

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